

The JPL Annual Invention Challenge is ready for its eighth year. The title for this year's contest is the **Strike a Match Contest**. The objective and rules are listed below. Questions related to this contest and entry forms should be directed to: Paul MacNeal at: work phone (818)354-7824, FAX (818)393-5239, M/S 301-486, located in Building 301-475SS, or e-mail to paul.d.macneal@jpl.nasa.gov.

Objective: Create a device that utilizes at least three different sequential and dependent actions from three different energy categories that will ultimately light an officially supplied wooden stick match exactly twenty (20) seconds after starting the device. The winner of the contest will be the person whose device accumulates the highest point total as outlined in the rules that follow.

Rules:

ELIGIBILITY

- 1) The contest is open to all JPL employees, contractors, and immediate family members. JPL family members and friends are welcome to watch the contest, but must be cleared through the security office prior to arrival. The contest is also open to teams of students from Southern California middle schools and high schools.

REGISTRATION - JPL

- 2) Applications for JPL employees, contractors, and immediate family members entering the contest must be filled out and submitted to Paul MacNeal prior to midnight November 25, 2005. An entry form is included at the end of the rules. All entries will be time stamped by Paul MacNeal based upon the time received. Only the first 20 JPL/contractor entries will be permitted to compete. Five alternates will be accepted in case some entries withdraw prior to the competition.

REGISTRATION - SCHOOLS

- 3) Applications for school teams must be filled out and submitted to Paul MacNeal no earlier than September 12, 2005 and no later than midnight October 7, 2005. An application form is included at the end of the rules. Student teams will be notified to verify their acceptance into the contest one week later. All entries will be time stamped by Paul MacNeal based upon the time received. Questions regarding the entry forms can be directed to Rich Alvidrez (818)354-1214. Each school is allowed no more than three teams. Internal school competitions are encouraged to select the top three teams if necessary.

SPECIAL RULES FOR SCHOOL TEAMS

- 4) Only the first 75 student team entries will be permitted to compete at the regional competitions. Student teams will compete at a regional competition held on Saturday, November 19, 2005 at California State University at Fullerton and one additional site near Los Angeles (TBD). Details for the regional competitions will be sent to all registered teams. The top five winners of each regional competition will be invited to compete at the JPL contest held on Friday, December 2, 2005 (see Rule 5 below). In addition, the next closest ten entries between both regional competitions will be invited to compete at the JPL contest. All student teams that participate in the JPL contest must be cleared through the JPL

security office prior to arrival. All participants that attend the JPL contest will be required to have their parent or guardian sign a photography release prior to their arrival at JPL.

LOGISTICS

- 5) The contest date and time is Friday, December 2, 2005 between 11:30 AM and 1:00 PM. The contest is held at the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109. The contest area is located north of the fountain area, in front of the Administration Building (Bldg. 180) steps. In the event of inclement weather (rain or high winds), the contest may be held indoors at JPL's vonKarman Auditorium or postponed. Check-in for the event will begin at 10:15 AM.

DEVICE RULES

- 6) The device must have the following characteristics:
- a) Be initiated by a single operation (cut a string, flick a switch, pull a pin, etc) provided by the contestant. No human power may be used to add dynamic or potential energy for the operation of the device.
 - b) Be no wider than 48 inches or longer than 48 inches. Height is limited to 96 inches.
 - c) Have a flat bottom surface that can be placed on a flat, level table approximately 30 inches above the ground. The surface of the table will be 36 inches wide and 48 inches long.
 - d) Not have any portion hang below the surface of the table at the start of the run.
 - e) Not use any remote control devices.
 - f) Incorporate a total of three or more actions that are sequential and dependent upon the previous action. Each of these actions must use different forms of energy to operate the action. The sequence of actions must end with an action that lights the match (See Rule 6h). The forms of energy must be chosen from three or more categories as defined below. The action to initiate the device (See Rule 6a) does not count as one of the three required actions.
Energy Categories are:
 - Gravity (such as free-fall or ramps),
 - Springs (such as tension springs, bungee cords, rubber bands, torsional springs, etc.),
 - Pressurized fluids (such as air or water) that are safe (permission must be granted by the contest director, Paul MacNeal),
 - Motors/engines (must use safe energy supplies),
 - Other (must be approved in advance of contest).
 - g) Allow the officially supplied wooden stick match to be installed just before the start of the run. It will be handed out during the set-up time. The match is 2.37 inches long and has a base that is 0.12 inches by 0.12 inches. Similar matches can be purchased for practicing. They are Diamond[®] Brand "Strike Anywhere Large Kitchen Matches" as shown in the photograph below.



- h) Be capable of lighting the officially supplied wooden stick match twenty (20) seconds after initiating the device by causing the tip of the match to dynamically rub against a frictional surface. The match does not need to remain lit for any length of time, but it must spark and attempt to light.
- i) Have something physically and visibly moving at all times once the device is started. A specific example that is not allowed is the motion of an analog clock.
- j) There are no weight restrictions.
- k) All construction materials are acceptable, except that no explosives, caustic chemicals, or other materials that might cause personal injury are allowed.
- l) May be composed of one or more discrete parts.
- m) Electrical power from a standard 120 V source (15 amps maximum) is allowed. The electrical cord may extend beyond the size as specified in Rule 6b.

SCORING

- 7) Points are awarded as follows:
 - a) Maximum allowed total of points that can be accumulated is 100 points.
 - b) Points for lighting the match (35 points maximum)
 - i) 35 points if the completion time is 19.5 seconds to 20.5 seconds after initiating the device, or
 - ii) 32 points if the completion time is 19.0 seconds to 21.0 seconds after initiating the device, or
 - iii) 28 points if the completion time is 17.0 seconds to 23.0 seconds after initiating the device, or
 - iv) 25 points if the completion time is 15.0 seconds to 25.0 seconds after initiating the device, or
 - v) 10 points if the completion time is 10.0 seconds to 30.0 seconds after initiating the device, or
 - vi) 0 points if the match is never lit or it occurs sooner than 10 seconds or longer than 30 seconds.
 - c) Points for actions (25 points maximum)
 - i) 25 points for using three or more actions from at least three different energy categories, or
 - ii) 15 points for using three or more actions from two or fewer energy categories, or
 - iii) 0 points for using less than three actions.

- d) Points for completing the task without human intervention (20 points maximum)
 - i) 20 points for not needing to touch the device in any way after the initiation of the device, or
 - ii) 10 points for touching the device (restart, nudge, push, etc.) only once after the initiation of the device, or
 - iii) 5 points for touching the device (restart, nudge, push, etc.) only twice after the initiation of the device, or
 - iv) 0 points for touching the device (restart, nudge, push, etc.) three or more times after the initiation of the device.
 - v) If the match is lit by human intervention, then the contestant and their device will be disqualified.
- e) Points for creativity (10 points maximum)

Based on independent set of judges. Judges decisions are final.
- f) Points for artistry (5 points maximum)

Based on independent set of judges. Judges decisions are final.
- g) Points for unusual features (5 points maximum)

Based on independent set of judges. Judges decisions are final.

CONTEST PROCEDURE

- 8) Contestants will have one opportunity to operate their device. The order in which teams will participate is selected by a random process. The contestant will be given a five-minute period of time to set-up, operate their device, and remove the device from the contest site. Strict time limits will be imposed to ensure that all contestants are able to operate their device. The official starter will give a countdown (3....2....1....GO!) for the start of operation of the device. Timers will start the time at the starter's direction. The timers will stop the watch at the direction of the official starter. The official starter will voice an audible "STOP!" when the match has been lit in accordance with Rule 6h. The contestant will then be asked to quickly remove their device from the contest site and place their entry in an area designated by contest officials for further judging.

OFFICIAL SCORING PROCEDURES

- 9) The time will be averaged by two or more official timers. The official time will be recorded to the nearest 0.01 seconds and the points for lighting the match will be recorded (Rule 7b). The field judge will award points for energy methods (Rule 7c). The field judge will award points for lack of human intervention (Rule 7d). The independent set of judges will be allowed to review all of the entries prior to awarding the points for creativity (Rule 7e), artistry (Rule 7f), and unusual features (Rule 7g). The total sum of all points will be totaled and recorded by the recording secretary.

AWARDS

- 10) In case of a tie, equal trophies will be awarded. Trophies will be divided into two categories: JPL employees/family/contractor entries and school team entries. Trophies for highest point total will be given for first, second, and third place for each category at all contests (regional contests and the JPL contest). Certificates will be issued for the lightest, heaviest, smallest, largest, most unusual, most artistic, and most creative designs.

JPL EMPLOYEE, CONTRACTOR OR FAMILY MEMBER ENTRY FORM FOR 2005
INVENTION CHALLENGE

ENTRY NUMBER _____

Date Received: _____ Time received: _____

Name(s): _____

M/S: _____

Phone: (____) _____

E-mail Address: _____

Title of Entry (be creative): _____
Put name of contestant and title of entry somewhere on the device

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FOR OFFICIAL USE ONLY

Weight: _____ pounds

Length: _____ inches, Width: _____ inches, and Height: _____ inches

Time for operation _____ seconds → Score _____

Number of actions used _____ }
Energy method categories used _____ } → Score _____

Human interventions after start of device _____ → Score _____

Creativity score (10 max) → Score _____

Artistic score (5 max) → Score _____

Unusualness score (5 max) → Score _____

Comments:

TOTAL SCORE: _____

SCHOOL ENTRY FORM FOR JPL 2005 INVENTION CHALLENGE

ENTRY NUMBER _____

Date Received: _____ Time received: _____

School Name: _____

Single Point of Contact Information:

Name : _____

Phone: ()

Email Address: _____

School Address: _____

Street	City	Zip Code

Team Name:

Team Members and ages:

1) _____

2)

3)

4)

5)

6)

7)

8)

Note: All students that participate at JPL will need to have their parent or guardian sign a photography waiver!

Teacher/Educator Advisor:

Phone of Advisor:

Title of Entry (be creative): _____
Put name of school and title of entry somewhere on the device

SCHOOL NAME _____ ENTRY NUMBER _____

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Weight: _____ pounds

Length: _____ inches, Width: _____ inches, and Height: _____ inches

Time for operation _____ seconds → Score _____

Number of actions used _____ } → Score _____

Energy method categories used _____ }

Human interventions after start of device _____ → Score _____

Creativity score (10 max) → Score _____

Artistic score (5 max) → Score _____

Unusualness score (5 max) → Score _____

Comments:

TOTAL SCORE: _____